

CALIBRATING THE NI™ 5102 WITH CALIBRATION EXECUTIVE

Contents

Introduction	2
What Is Calibration?	2
Why Should You Calibrate?	2
How Often Should You Calibrate?	2
Equipment and Other Test Requirements	3
Test Equipment	3
Recommended Equipment	3
Alternative Equipment	4
Connectors	4
Documentation	4
Software	5
Test Conditions	5
Calibration Procedures	6
Connecting Your Calibrator, DMM, and NI 5102	6
Running the Calibration Executive Procedure	6
Viewing the Calibration Report	7
Technical Support Resources	8
NI Web Support	8
Worldwide Support	8

Introduction

This document contains information and step-by-step instructions for loading and running the calibration procedure for the NI 5102 using Calibration Executive.

What Is Calibration?

Calibration consists of verifying the measurement accuracy of a device and correcting for any measurement error. *Verification* is measuring the performance of a device and comparing the results to the factory specifications of the device. National Instruments calibrates every 5102 device at the factory. During the factory calibration process, the calibration constants are stored on the EEPROM. These values are loaded from memory and used as needed by the device.

Why Should You Calibrate?

The accuracy of electronic components drifts with time and temperature, which can affect measurement accuracy as the device ages. Calibration restores your device to its specified accuracy and ensures that it still meets National Instruments standards.

How Often Should You Calibrate?

The measurement accuracy requirements of your application determine how often you should externally calibrate your NI 5102 device. National Instruments recommends that you perform a complete calibration at least once every year. You can shorten this interval to 90 days or six months based on the demands of your application.

You can also use the verification procedure at a regular interval to determine if your oscilloscope needs adjustment.

Equipment and Other Test Requirements

This section describes the equipment, documentation, software, and test conditions needed for calibration.

Test Equipment

Tables 1 and 2 list specifications for equipment you can use to calibrate your NI 5102 with Calibration Executive.

Recommended Equipment

Table 1 lists the equipment that National Instruments recommends for this procedure.

Table 1. Required Equipment Specifications for NI 5102 Calibration

Required Equipment	Recommended Equipment	Parameter Measured	Necessary Specifications
Scope Calibrator	Wavetek 9500 Scope Calibrator	Vertical Offset	0 VDC \pm 0.1 mV
		Vertical Gain	DC \pm 40 mV to \pm 4.5 V, \pm 0.1% into 1 M Ω
		AC Coupling	sine wave 9–13 Hz \pm 100 ppm, 1.8 Vpp \pm 2% into 1 M Ω
		Bandwidth	1.5% amplitude flatness for leveled sine wave 100 kHz–15 MHz \pm 50 ppm, 0.2–1.9 Vpp \pm 2% into 1 M Ω
		Input Impedance	2-wire resistance accuracy of 0.25% for 1 M Ω measurement
Active Head	Wavetek 9510 Active Head or better	—	—

If you do not have the recommended instruments, use the accuracy requirements listed above to select a substitute calibration standard. Refer to Table 2 for a list of alternative instruments you can use for the calibration procedure. Although these instruments are acceptable, National Instruments recommends that you use the instruments from Table 1.

Alternative Equipment

Table 2 contains a list of alternative equipment you can use to calibrate your NI 5102 with Calibration Executive.

Table 2. Alternative Equipment Specifications for NI 5102 Calibration

Required Equipment	Recommended Equipment	Parameter Measured	Necessary Specifications
Calibrator	Fluke 5700 Calibrator	Vertical Offset	0 VDC ± 0.1 mV
		Vertical Gain	DC ± 40 mV to ± 4.5 V, $\pm 0.1\%$ into 1 M Ω
		AC Coupling	sine wave 9–13 Hz ± 100 ppm, 1.8 Vpp $\pm 2\%$ into 1 M Ω
High-Speed Signal Generator	Tektronix SG503	Bandwidth	1.5% amplitude flatness for leveled sine wave 100 kHz–15 MHz ± 50 ppm, 0.2–1.9 Vpp $\pm 2\%$ into 1 M Ω
DMM	HP 34401	Input Impedance	2-wire resistance accuracy of 0.25% for 1 M Ω measurement

Connectors

If you are using the Wavetek 9500 and the Active Head, you do not need special connectors.

If you are using the alternative instruments listed in Table 2, you need the following connection equipment:

- 50 Ω BNC cable
- 50 Ω BNC terminator
- BNC T-connector

Documentation

This section describes the documentation you need to calibrate your 5102 device. In addition to this calibration procedure, you may need to refer to the following documents:

- *NI-SCOPE Instrument Driver Quick Reference Guide*
- *Where to Start with Your NI 5102 Oscilloscope*
- *NI 5102 User Manual*

You can download these documents from the National Instruments Web site at ni.com/manuals

Software

Complete the following steps to install Calibration Executive:

1. Make sure that your computer and monitor are powered on and that you have installed Windows 2000/NT/Me/9x.
2. Close all open applications.
3. Insert the installation CD into the CD-ROM drive.
4. Choose the **Run** option from the **Start** menu on the desktop task bar.
5. In the command line box, type `x:\setup.exe` (where *x* is the letter of the CD-ROM drive you are using), and click **OK**.
6. Follow the instructions that appear in the dialog boxes.

The setup program installs Calibration Executive as well as the associated files listed in Table 3.

Table 3. Calibration Executive Directories and Supporting Files

Directory Name	Contents
CalExec\Procedures\NI 5102\Limits	Microsoft Access database that stores the calibration limits.
CalExec\Procedures\NI 5102\Support Files	Directory structure that contains the calibration procedures.
CalExec\Procedures\NI 5102\Support Files	Required support files.

Test Conditions

Follow these guidelines to optimize the connections and the environment during calibration:

- Keep connections to the NI 5102 short. Long cables and wires act as antennae, picking up extra noise that can affect measurements.
- Use a 50 Ω BNC coaxial cable for all connections to the device.
- Keep relative humidity between 10 and 90%, noncondensing, or consult your device hardware manual for the optimum relative humidity.
- Maintain the temperature at 25 °C.
- Allow a warm-up time of at least 15 minutes to ensure that the measurement circuitry of the 5102 is at a stable operating temperature.

Calibration Procedures

This section explains how to set up and run the Calibration Executive procedure.

Using the Wavetek 9500 in automated mode, the calibration procedure takes approximately ten minutes. In manual mode, the procedure takes approximately 30 minutes.

Using the alternative instruments in automated mode, the calibration procedure takes approximately 20 minutes. In manual mode, the procedure takes approximately 40 minutes.

Connecting Your Calibrator, DMM, and NI 5102

The calibration procedure steps you through the connections between the calibrator, function generator, DMM, and NI 5102.



Note You do not need a function generator or a DMM if you are using the Wavetek 9500.

Running the Calibration Executive Procedure

To run the Calibration Executive calibration procedure, complete the following steps:

1. Launch Calibration Executive and follow the instructions in the in the Calibration Configuration Wizard to load the NI 5102 calibration procedure. Refer to Chapter 1, *Introduction to Calibration Executive*, in the *Calibration Executive Software User Manual* if you need more information on configuring and loading a calibration procedure.
2. When prompted by Calibration Executive, enter information about the installed hardware, such as the calibrator, function generator, and DMM.



Note If you are using the Wavetek 9500, you will not need a function generator or a DMM, so you can leave `none` selected in the list boxes for **Selected Generator Information**, **Selected DMM Information**, and **Available Addresses**. You must also enter `N/A` in the appropriate fields for the tracking numbers and calibration due dates before you can proceed. The calibration report does not include any of this extra information if you are using the Wavetek 9500.

3. When the procedure is loaded, click **Run Procedure** to begin. The procedure prompts you to enter the device number, which is the number assigned by Measurement & Automation Explorer (MAX).
4. Follow any instructions you receive from Calibration Executive.

Viewing the Calibration Report

When the procedure is finished, complete the following steps to view the calibration report:

1. Click **View»Reports**.
2. Select **View** to launch your browser and view your report. The calibration report appears as a printable HTML file.

You have completed calibrating your NI 5102 with Calibration Executive.



Note If your NI 5102 device fails after calibration, return the device to National Instruments for repair or replacement.

Technical Support Resources

NI Web Support

National Instruments Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of ni.com

Worldwide Support

National Instruments has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of ni.com. Branch office Web sites provide up-to-date contact information, support phone numbers, e-mail addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or National Instruments corporate. For telephone support in the United States, dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

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